

REMARKS

1. The specification as been amended at page 1 to insert US serial numbers of co-pending applications and to delete the docket numbers.
2. Applicant has carefully considered the office action dated December 30, 2002. Applicant respectfully submits that the amendments and the following remarks are fully responsive to the office action.
3. Applicant has amended the claims in light of the office action. Applicant respectfully submits that no new matter has been added as a result of the amendment.
4. In paragraph 2 of the Detailed Action, the Examiner has rejected claims 5 to 10 under 35 U.S.C. 102 (b) as being anticipated by Chan et al.
5. Claims 5, 7, and 9 have been amended to emphasize the fact that the expansive element is a thermoelastic actuator for a micro-electromechanical device. The remaining claims are dependent on these claims. It is respectfully submitted that this amendment serves to limit the claims further. In this regard, the Examiner's attention is respectfully drawn to MPEP 2111.02 in which preamble statements are held to be limiting, where such a limitation finds basis in the specification. In this case, page 2 of the specification sets out that: "The invention as developed originally as a means of identifying and ranking a range of materials that potentially may exhibit superior properties for use in the manufacture of microscopic thermal bend actuators for use in micro-electro mechanical systems (MEMS), and will be described hereinafter with reference to this field."
6. Chan et al is directed to a thermo-mechanical sensor for sensing temperature variations. It follows that Chan et al describes a mechanism that relies on an external temperature change to achieve deflection and the necessary switch operation. On page 2, lines 14 to 16 of the present application, however, it is set out that: "It is important to clarify that thermoelastic actuation is characterized using force, deflection and temperature as opposed to switching, which is characterized using deflection and temperature rise alone." It follows that Applicant respectfully submits that the sensor of Chan et al cannot be regarded as equivalent to the actuator of the invention as claimed in the amended claims. Thus, in view of the fact that the amendment limits the claims further, Applicant submits that Chan et al no longer anticipates the invention as claimed in the amended claims.

7. In paragraph 3 of the Detailed Action, the Examiner has rejected claims 7 to 10 under 35 U.S.C. 102(b) as being anticipated by Chan et al. (The Examiner has cited "Carr et al". However, it appears that the Examiner has made an error and intended to cite Chan et al.)
8. In support of this, the Examiner has stated that: "Chan et al discloses the claimed metal compounds used in an expansive element..."
9. As set out above, the claims have been amended to replace reference to an "expansive element" with a "thermoelastic actuator for a micro-electromechanical device". As set out above, it is respectfully submitted that the sensor of Chan et al cannot be regarded as equivalent to the actuator of the invention as claimed in the amended claims. As before, Applicant submits that, in view of the limiting amendment, Chan et al does not anticipate the claims, as amended.
10. In paragraph 4 of the Detailed Action, the Examiner has rejected claims 7 to 10 under 35 U.S.C. 102(e) as being anticipated by Bozler et al. In support of this, the Examiner has stated that: "Bozler et al discloses the claimed metal compounds used in an expansive element."
11. Bozler et al discloses an actuator device that uses electromagnetic force to achieve actuation, rather than a combination of thermal expansion and elasticity. For example, in column 4, lines 62 to 67 of Bozler et al, there is set out that: "When a voltage is applied between electrodes 104 and 106 an electric field and therefore a force is created which, if the voltage is sufficiently large, pulls down the moveable electrode 106 into contact first with substrate near the attachment point 107, and with a rolling action eventually brings the insulating layer 114 at the end of the movable electrode 106 into contact with an insulator layer 124 provided on top of the fixed electrode 122."
12. Applicant thus respectfully submits that Bozler et al does not disclose a thermoelastic actuator as described in the amended claims.
13. In paragraph 5 of the Detailed Action, the Examiner has rejected claims 7 to 10 under 35 U.S.C. 102(e) as being anticipated by Carr. In support of this, the Examiner has stated that Carr discloses the claimed metal compounds used in an expansive element.

14. It is respectfully submitted that Carr does not disclose a thermoelastic actuator. Rather, Carr discloses a "cantilevered microstructure that is designed to respond to acceleration events." (Column 1, lines 10 and 11).
15. Carr discloses the use of thermal expansion for the purposes of resetting a micro-accelerometer from a "latched" condition to an "unlatched" condition. In this regard, the Examiner's attention is respectfully directed to column 6, lines 42 to 58 and column 7, lines 55 to 65. It is therefore respectfully submitted that the thermal expansion component of Carr is analogous to a switch arrangement.
16. As set out above, the specification of the present application has specifically pointed out the notable differences between micro-electromechanical switching and thermoelastic actuation. It is thus respectfully submitted that Carr does not disclose a thermoelastic actuator.
17. In paragraph 7 of the Detailed Action, the Examiner has rejected claims 5 to 10 under 35 U.S.C. 103(a) as being unpatentable over Yang et al and Ozaki et al.
18. In support of this, the Examiner has stated that: "Yang et al disclosed and (sic) metal nitride used as part of an actuator (see figure 1). Ozaki et al discloses the claimed metal compounds used as electrical materials (Abstract). Thus it would have been obvious to one of ordinary skill in the art to used (sic) the claimed metal compounds in an actuator, as these materials are known in the electrical art to provide the claimed properties, as shown by Ozaki et al."
19. First of all, it is not clear why the Examiner has stated that Yang et al discloses a metal nitride. The claims, even prior to amendment, do not describe the use of a metal nitride.

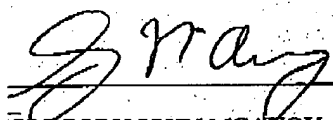
20. Secondly, Applicant respectfully submits that Yang et al qualifies as non-analogous prior art for 35 U.S.C. 103(a). Yang et al discloses a heater/sensor element and falls in the field of integrated circuits. It is clear from a reading of Yang et al that such an element is not a micro-electromechanical system, as is the present invention. The field of micro-electromechanical systems is extremely large. A search word "MEMS" used on the www.google.com search engine returned 379000 hits. It is respectfully submitted that a person of ordinary skill in the field would appreciate that the fields of micro-electromechanical systems and integrated circuits are indeed separate. The main reason for this is that, unlike an integrated circuit, a micro-electromechanical system is required to perform work through microscopic mechanical operation. As a result, the material requirements of such a system are substantially different to those of an integrated circuit. It follows that a person of ordinary skill in the field would not look to the field of integrated circuits when attempting to achieve an improvement in a thermoelastic actuator.
21. It is respectfully submitted that Ozaki et al does not disclose a micro-electromechanical system. In particular, Ozaki et al does not disclose a thermoelastic actuator for a micro-electromechanical system. It is therefore respectfully submitted that no combination of Ozaki et al and Yang et al can produce a thermoelastic actuator for a micro-electromechanical device. Thus, Applicant respectfully submits that there is no reason why a person of ordinary skill in the field would not look to Ozaki et al, whether alone or in combination with Yang et al when attempting to achieve an improved thermoelastic actuator for a micro-electromechanical device.

CONCLUSION

It is respectfully submitted that all of the Examiner's objections have been successfully traversed. Accordingly, it is submitted that the application is now in condition for allowance. Reconsideration and allowance of the application are courteously solicited.

Very respectfully,

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